U. S. Department of Energy

Thomas Jefferson National Accelerator Facility

200
Organization

200 Organization

This section of the Project Control System Manual outlines the organizational elements of the Project Control System process. Data for Jefferson Lab projects are organized in three main databases and managed by an integrated software suite. Project work to be performed is organized by developing a Work Breakdown Structure (WBS). A functional organization, composed of Jefferson Lab personnel and possibly outside contractors, is formed to assign project work activities to groups or individuals who will be responsible for performing the work. Using the WBS structure, Cost Accounts are established to facilitate the preparation of accurate project cost and schedule estimates and the collection and development of data for project control.

201 Project Control System Integration

There are three Jefferson Lab system components that are integrated to form the prime management tool for the Project Control System. All of the projects at Jefferson Lab are organized under the Jefferson Lab Enterprise Project Structure. This enterprise structure is a master project database containing information on projects under development and those in the execution phase. The Schedule Management System is the core software for this master project database. It is used extensively during project schedule development, planning and monitoring. The second component of the Project Control System is the Lab's financial system. This accounting database of fiscal transactions provides actual project costs to the third component, the Cost Management System. This software system integrates the project's resource-loaded schedule with the accounting system data to generate and analyze a project's cost and schedule performance. By linking the various project databases, the Schedule and Cost Management Systems can provide the project management team with the requisite earned value data to determine the current project status and to forecast cost and schedule estimates at project completion.

202 Work Breakdown Structure

A. The Work Breakdown Structure (WBS) (Exhibit 1) with its associated WBS dictionary is the key element for organizing a project. Its purpose is to divide the project into manageable segments of work to facilitate planning and control of technical scope, schedule and cost. A well designed WBS will ensure all required work is incorporated in the project and that no unnecessary work is included.

B. The WBS is a structural organization of related elements that defines the total work scope required to accomplish project objectives. It takes the form of a

multi-level hierarchical framework depicting the overall project deliverable down to the smallest system component. Each descending level represents an increasingly detailed definition of a project component. The project WBS describes the technical content of the project, and is the basis for project management, cost estimating and budgeting, schedule management, cost and schedule control, and reporting of cost and schedule performance. A high-level WBS is developed early in the conceptual stage of the project with more detail added as the project definition is refined. The level of detail in a WBS is a function of the size of the project and a balance between complexity, risk, and the Project Director's need for control.

C. Early and accurate WBS planning is essential to getting a project off to a good start. If project requirements change however, the WBS will evolve with the project. Revisions to the WBS may be required due to the expansion or contraction of project scope and/or the movement of a project through its various stages (i.e., design, engineering, development, production/installation, and operation). Modifications to the WBS are implemented by means of the Change Control process.

202.1 WBS Development

A. The project WBS is a product-oriented decomposition of the project (Exhibit 2) and is organized in multiple levels of increasing detail. The first three levels of the WBS are defined to facilitate overall assignment of project management responsibilities and the logical aggregation of cost data. WBS Level 1 is the entire project and represents the total responsibility assigned to the Project Director. For WBS Level 2, the overall project is divided into product-oriented segments and a process-oriented system for project management. Each Level 2/Level 3 (as appropriate) segment is managed by an Associate Project Manager. WBS Level 3 elements are definable components of Level 2 segments that accomplish a specific purpose.

B. Additional levels of the WBS (Levels 4, 5, 6, etc.) can be included as needed to extend the WBS to a level of detail necessary to reflect the complexity of the work scope. Not all legs of the WBS must be composed of the same number of levels. The Cost Account is the lowest level of the WBS and is the level at which cost estimates are prepared, time-phased budgets are prepared, actual costs are accumulated, and earned value is assessed.

C. Each Cost Account and higher WBS element is assigned a unique WBS number (see Exhibit 1). The WBS number is used to accumulate and report performance measurement data (cost estimates, budgets, earned value, and actual costs) and to summarize at higher WBS levels. Performance measurement data are derived directly from entry-level data collected or prepared at the Cost Account level.

202.2 WBS Dictionary

A complete Work Breakdown Structure requires an associated dictionary (Exhibit 3) to provide descriptive information for each WBS element. The WBS dictionary thoroughly describes the scope of each work element (including deliverables) identified in the WBS. It also outlines the resources and processes required to produce each element. As with the WBS itself, the WBS dictionary should be revised to reflect project changes and should be kept up to date during the life of the project.

203 Project Organization

A complementary arrangement to the WBS is the organizational structure (Exhibit 4) that will provide the resources required to perform the project work activities. Project leadership can design a hierarchical framework where unique work responsibilities can be established for each part of a project. The framework establishes the formal authority relationships that exist among the various project team elements. This can take the form of a standard organization chart with the structure progressively detailed downward to the lowest levels of management.

204 WBS and Organization Integration

Integrating Jefferson Lab organizations with the WBS ensures that all project work is accounted for and that each element of work is assigned to the level of responsibility necessary for planning, tracking progress, accumulating costs, and reporting. A Cost Account is comprised of a WBS work element and an individual with the authority to accomplish this work, the Cost Account Manager. Project cost, schedule and work scope requirements are integrated, planned and managed at the Cost Account level. Data collection takes place at the Cost Account level and can be summarized for higher levels of visibility into project plans and performance. All pertinent information concerning the Cost Account is captured in a Cost Account Plan with the Cost Account Manager responsible for its development and execution.

205 Responsibility Assignment Tree

Available from the Jefferson Lab Financial Management System, the Responsibility Assignment Tree ensures that each work element has an appointed authority for its accomplishment.

206 Exhibits

1. WBS Example
2. WBS Diagram Example
3. WBS Dictionary Example
4. Project Organization Example

Exhibit 1. WBS Example

WBS Level
1 2 3

1. 12 GeV Upgrade Project
- **1.0. CDR**
- **1.1. R&D**
- **1.2. PED**
- **1.3. Accelerator Systems**
  - **1.3.1. Cryomodules**
  - **1.3.2. Power Systems**
  - **1.3.3. Cryogenics**
  - **1.3.4. Beam Transport**
  - **1.3.5. Extraction**
  - **1.3.6. I&C / Safety Systems**
- **1.4. Upgrade Hall A, B & C**
  - **1.4.1. Hall A**
  - **1.4.2. Hall B**
  - **1.4.3. Hall C**
- **1.5. Hall D**
  - **1.5.1. Solenoid**
  - **1.5.2. Detectors**
  - **1.5.3. Computing**
  - **1.5.4. Electronics**
  - **1.5.5. Beamline**
  - **1.5.6. Infrastructure**
- **1.6. Civil**
  - **1.6.1. Accelerator**
  - **1.6.2. CHL**
  - **1.6.3. Hall D**
- **1.7. Project Management**
- **1.8. Pre-Ops**
- **1.9. Advanced Conceptual Design**

Exhibit 2. WBS Diagram Example

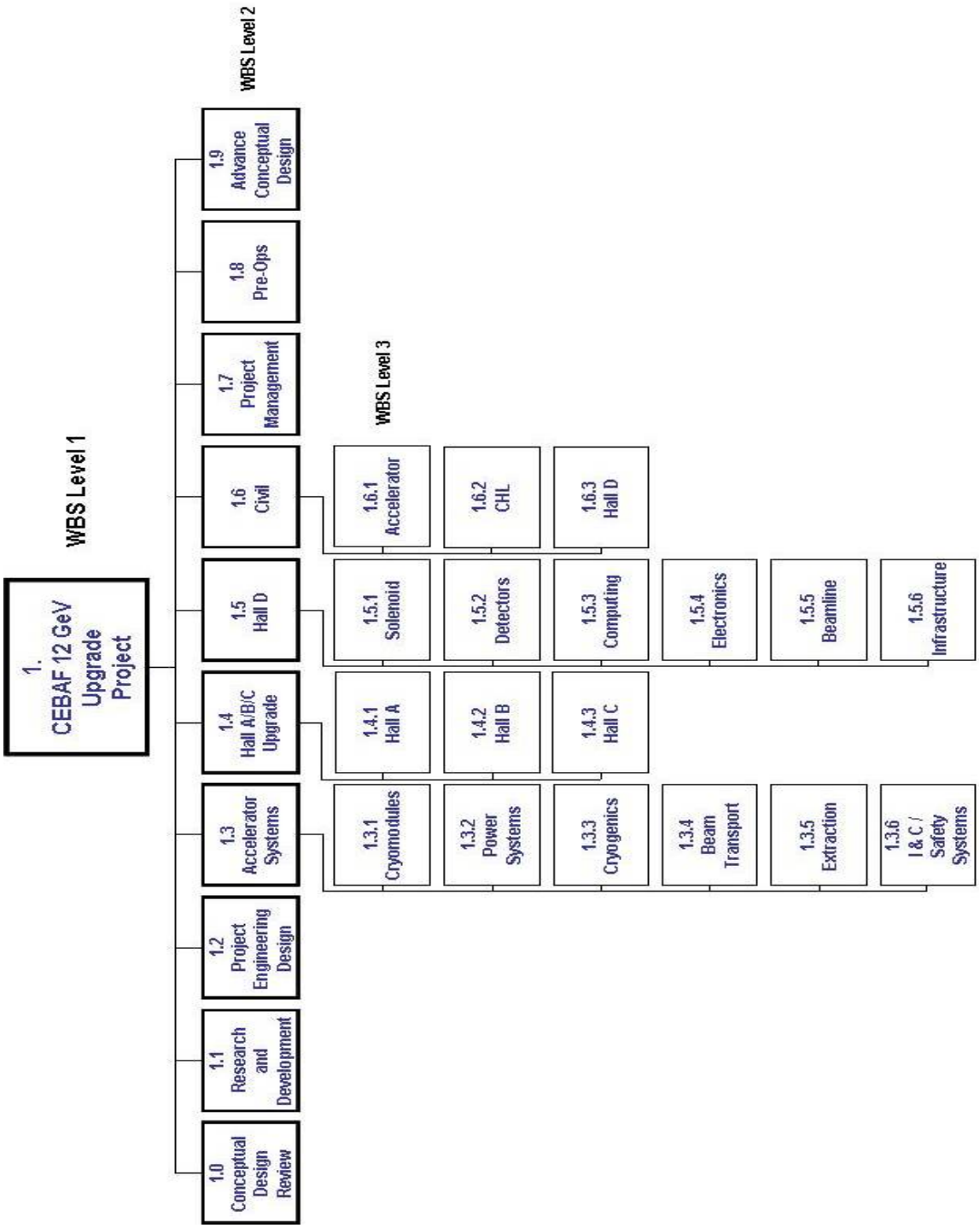

Exhibit 3. WBS Dictionary Example

WBS	Title	Description
1.2.1.3.1	Accelerator	
1.2.1.3.1.1	CHL Building Layout and Utilities Req	Existing and New CHL building detail requirements, equipment layout, utility schedules
1.2.1.3.1.2	CHL System P&ID Development	Process and Instrumentation Diagram Development for the Cryogenic Equipment Subsystems
1.2.1.3.1.3.	CHL Warm Helium Compressors	Equipment specification and design criteria for new CHL 1st and 2nd stage warm helium compressors
1.2.1.3.1.4.	CHL Cold Boxes	Equipment Specification and Design Criteria for the new CHL 4K cold boxes
1.2.1.3.1.5.	CHL Oil Removal System	Equipment Fabrication Design and material specification for the Final Oil Removal Equipment Assembly
1.2.1.3.1.6.	CHL Gas Management Rack	Engineering Design and Fabrication Documenation generation for the gas management valve rack assembly
1.2.1.3.1.7.	CHL System Instrumentation and Controls	Engineering Design and material specfication for the fabrication assembly of the new CHL instrumentation and control racks, programming, and system controls
1.2.1.3.1.8.	CHL Instrument Air System	Additional Instrument Air System to support new CHL control valve operations
1.2.1.3.1.9.	Motor Control Centers	480V and 4160V Motor Control Center Lineup Specification for purchase
1.2.1.3.1.10.	CHL Installation Design	Electrical, Mechanical, and Controls Installation Design Package generation for field installation construction phase
1.2.1.3.1.11.	CHL Commissioning	Startup and Performance Testing of Installed new CHL refrigerator system
1.2.1.3.1.12.	Linac Transfer Line	Completion of transfer line and bayonet assemblies, u-tubes for linac spare cryomodule slots

Exhibit 4. Project Organization Example